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Tumor Necrosis Factor Alpha (TNF-α), Nuclear Factor of kappa B (NF-kB) p65 and calcineurin expression play a role in the regulation of muscle regeneration process through aerobic exercise in HIV patients

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ABSTRACT

Background: Human Immunodeficiency Virus infection is a chronic disease with inflammatory conditions and experience progressive muscle wasting with increasing of tumor necrosis factor alpha. Physical exercise is a non-pharmacological therapy which stimulates the muscle regeneration. Moderate intensity of aerobic exercise is safe for human immunodeficiency virus patients. Whether tumor necrosis factor-alpha plays a role in the process of muscle regeneration in human immunodeficiency virus infection who have had tumor necrosis factor alpha level higher. Objective: To explain the role of tumor necrosis factor alpha, NF-kappaB, and Calcineurin expression in the regulation of muscle regeneration process.

Methods: Research subjects are population with clinical stage II human immunodeficiency virus infection. Subjects were grouped into two: I (n = 9) as subjects who got aerobic exercise for 8 weeks and C (n = 9) as subjects who were observed for 8 weeks. Muscle samples were taken from the vastus lateralis muscle biopsies that were performed 24 hours after the last physical exercise. And the immunohistochemical examination was done with anti- tumor necrosis factor alpha monoclonal antibody, anti- NF-kappaB, and anti-calcineurin.

Results: The relationship of muscle contraction to Tumor necrosis factor alpha and calcineurin expression, and to the other myogenic factors was significant, but not to NF-kappaB p65 expression.

Conclusion: Muscle regeneration process needs TNF-alpha and NF-kB p65 expression as regulators with TNF-alpha, NF-kB p65, myogenic factors as the path of exercise and calcineurin expression as a regulator with calcineurin myogenic factors as the path of exercise.

Keyword: Human Immunodeficiency Virus, aerobic exercise, muscle regeneration process, Tumor Necrosis Factor Alpha

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INTRODUCTION

Infection causes muscle wasting in Human Immunodeficiency Virus (HIV) or immunological failure and secondary infection. Human immunodeficiency virus infection is a condition of chronic immune activation that causes the release of pro-inflammatory markers[1] so that an increase of pro-inflammatory cytokines occurs in blood circulation, especially Tumor Necrosis Factor Alpha (TNF-alpha). Some research showed the molecular data that TNF-alpha is an activator of NF-kappaB (NF-kB) in muscle, and even known as a specific activator of NF-kB in HIV infection.[2]

Research of Chazaud and his colleagues (2003) suggested that the increased TNF-alpha at a certain level is required in the process of muscle regeneration, whereas calcineurin (CaN) plays an important role in the regulation of growth, and skeletal muscle plasticity.[3] Skeletal muscle plasticity requires stimulation in the form of physical exercise. Based on the dual function of TNF-alpha in muscle regeneration, this study was conducted to elucidate the function as well as other factors that play a role in the muscle regeneration in a population of HIV infection.

MATERIALS AND METHODS

The subjects in this study were male of HIV infection clinical stage II. The subjects were screened with WHO criteria,[4] aged 21–50 years, in the outpatient clinic of infectious unit Dr. Soetomo General Hospital. Participants were screened with a medical questionnaire to affirm that they had not suffered from the opportunistic disease. Bleeding risk was screened with the bleeding time. Potential risks and requirements of this study were outlined in an informed consent form, and a written consent was obtained from the participants before their participation in the study. The Ethics committee approved the study at Dr. Soetomo General Hospital.

The subjects in the intervention group were given aerobic exercise with the frequency of 2 times per week, intensity 60–70% of maximum heart rate, duration of 23 minutes (warm-up and stretching 6 minutes, the core exercise 13 minutes, and